

Fig. 1(A)

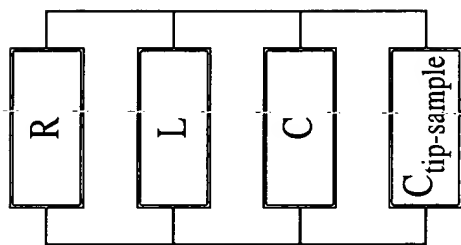


Fig. 1(B)

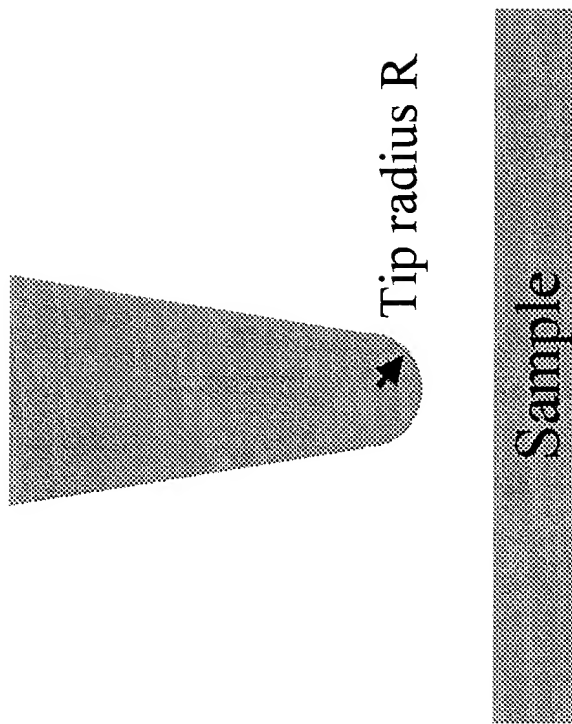


Fig. 2

# Calculation

Since  $\lambda \gg R_0 \sqrt{|\epsilon|}$

The field distribution is approximately quasi-static and can be calculated by the method of images.

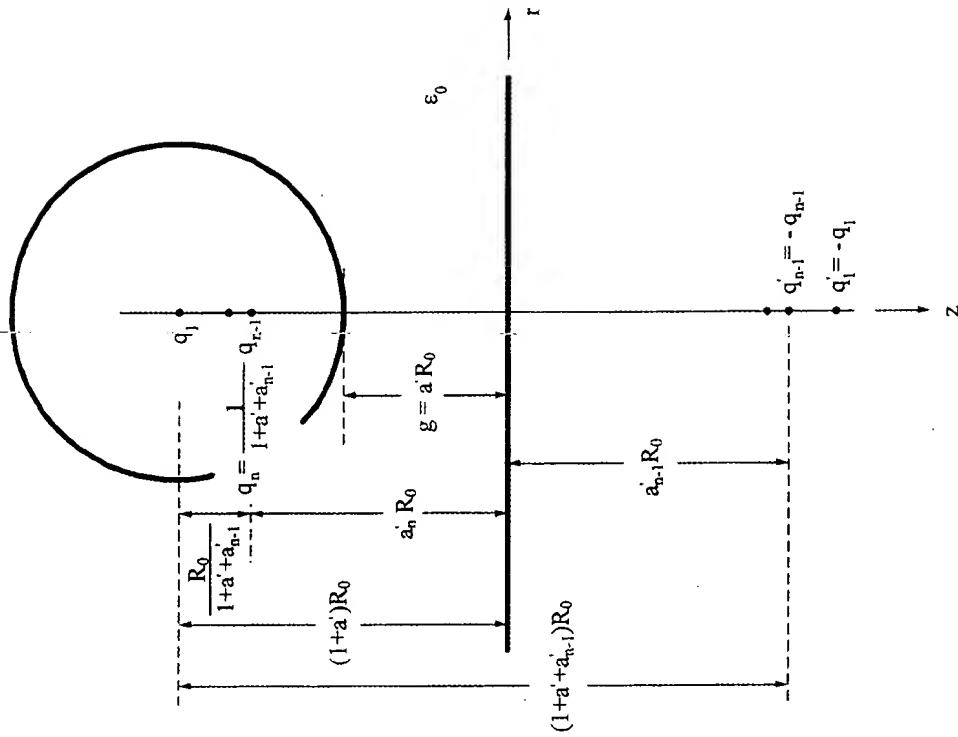


Fig. 3

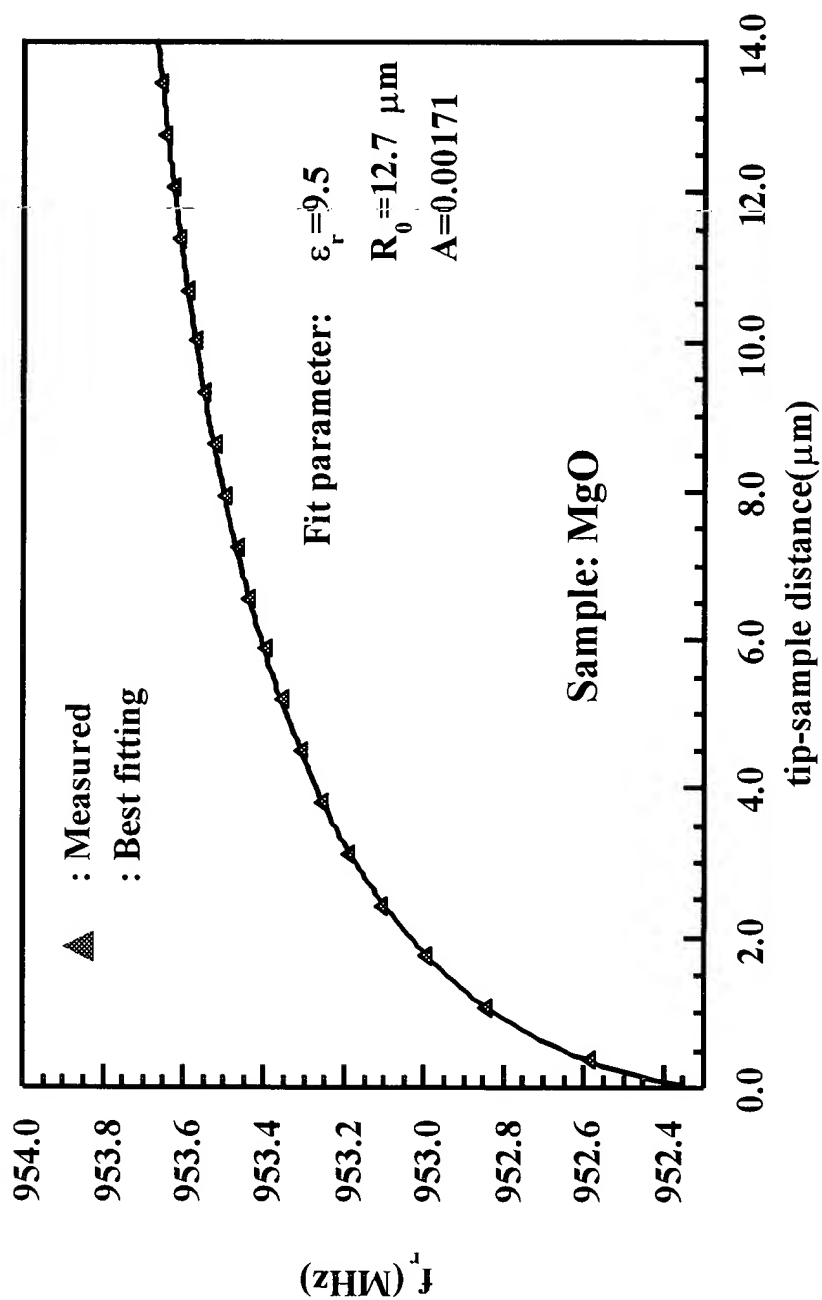


Fig. 4

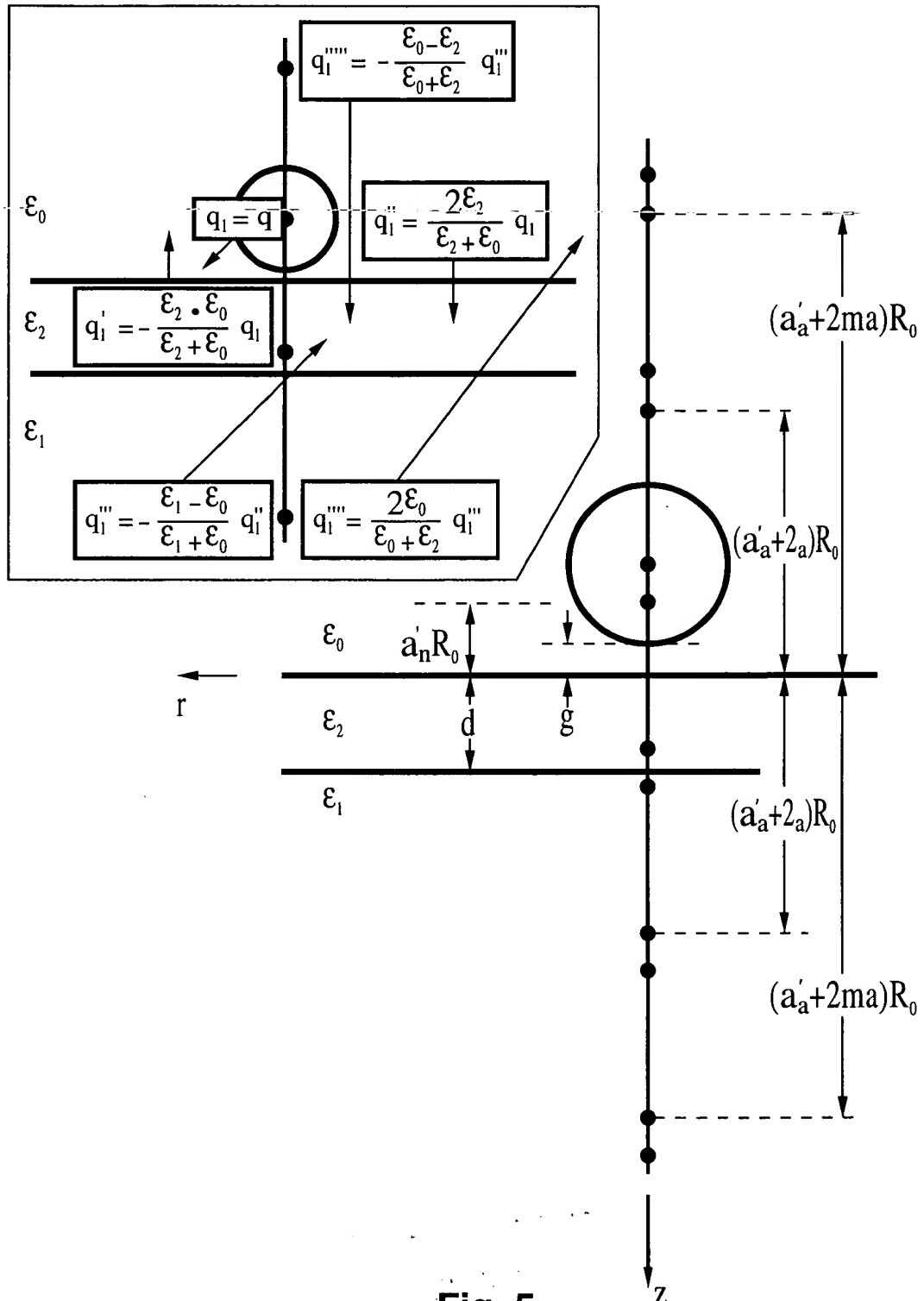


Fig. 5

$$\left(\frac{\delta f}{f_0}\right)\omega = A \varepsilon_{33} E_1$$

$$\bar{E}_1 = \frac{1}{32} \frac{V}{R_0} \frac{\varepsilon_{33} + \varepsilon_0}{2\varepsilon_0}$$

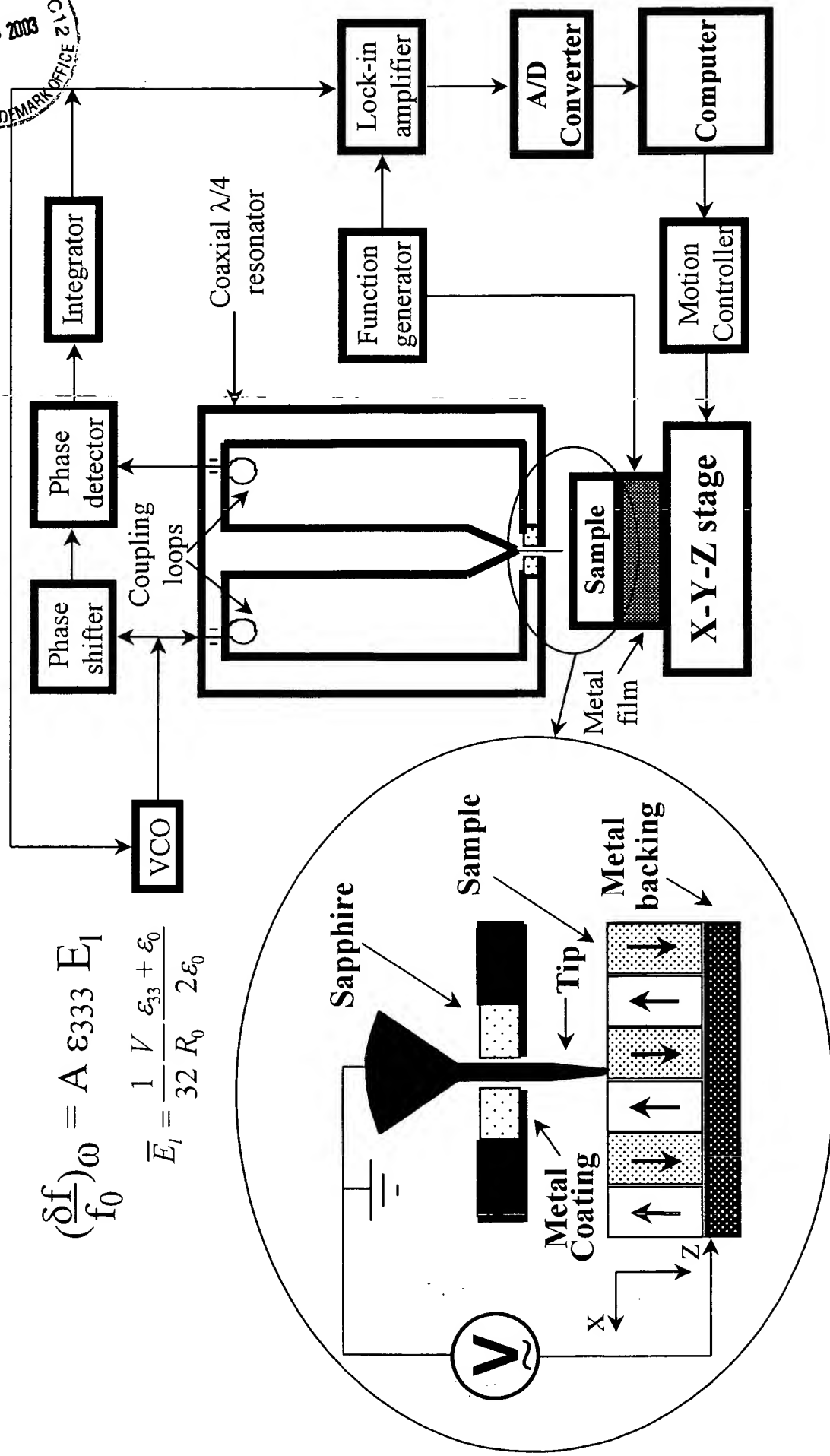
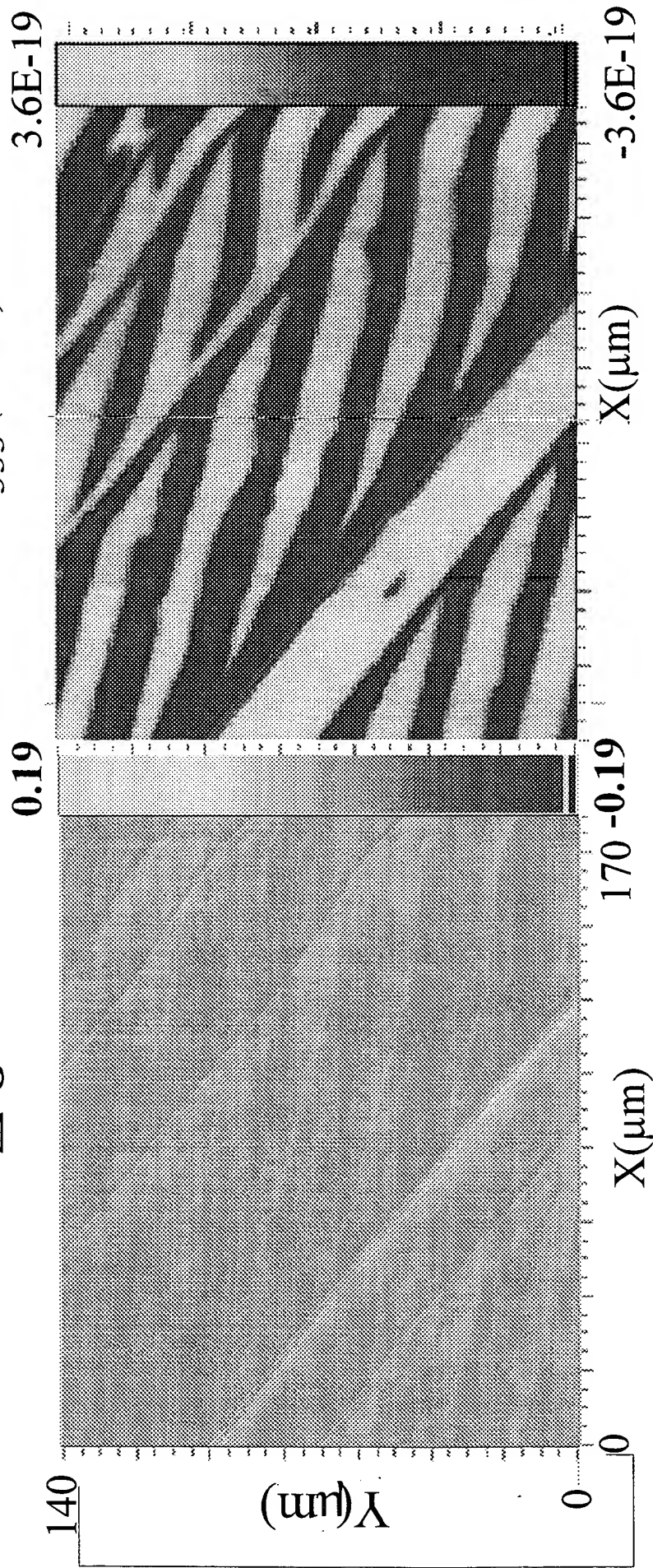


Fig. 6

$$\frac{\partial D_3}{\partial E_m} = \epsilon_{33} + \epsilon_{333}(E_l + E_m) + \frac{1}{2}\epsilon_{3333}(E_l + E_m)^2 + \dots$$

$$\Delta \epsilon = \epsilon_{333}(F/V)$$



Sensitivity  $\Delta\epsilon/\epsilon \sim 10^{-3}$

Fig. 7

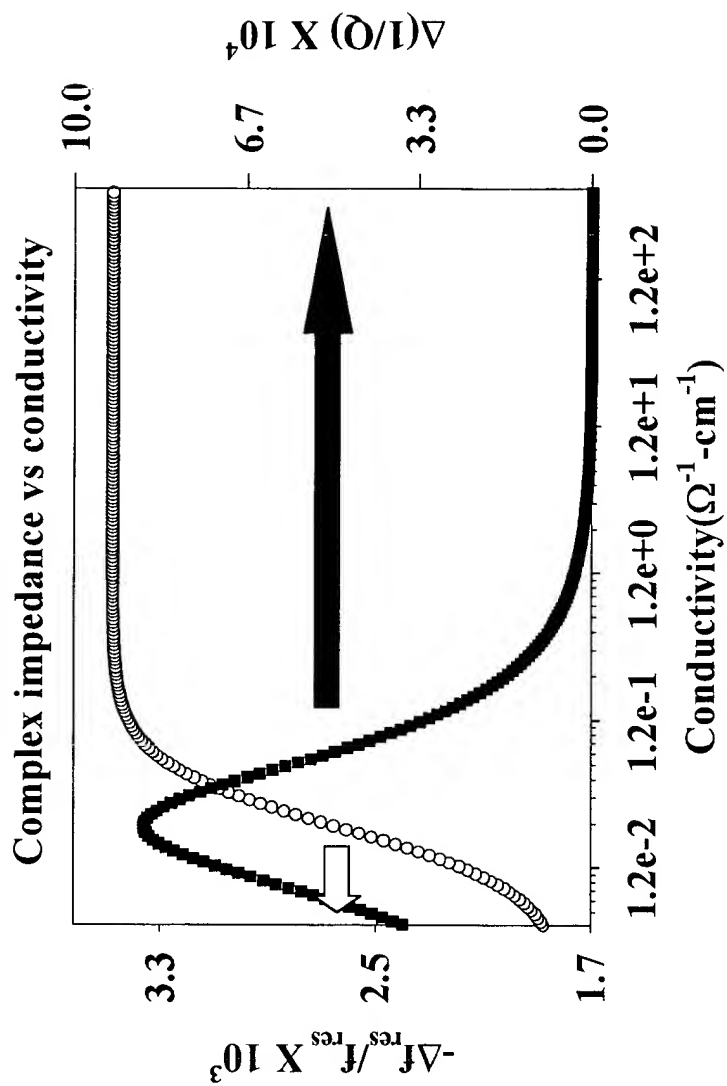


Fig. 8



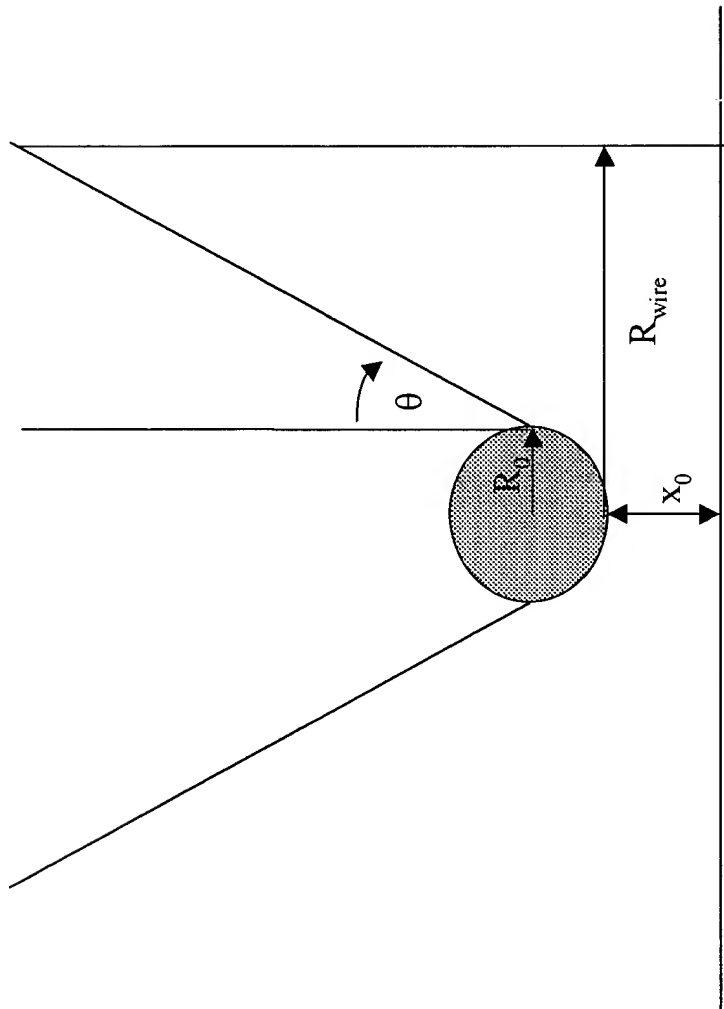


Fig. 9

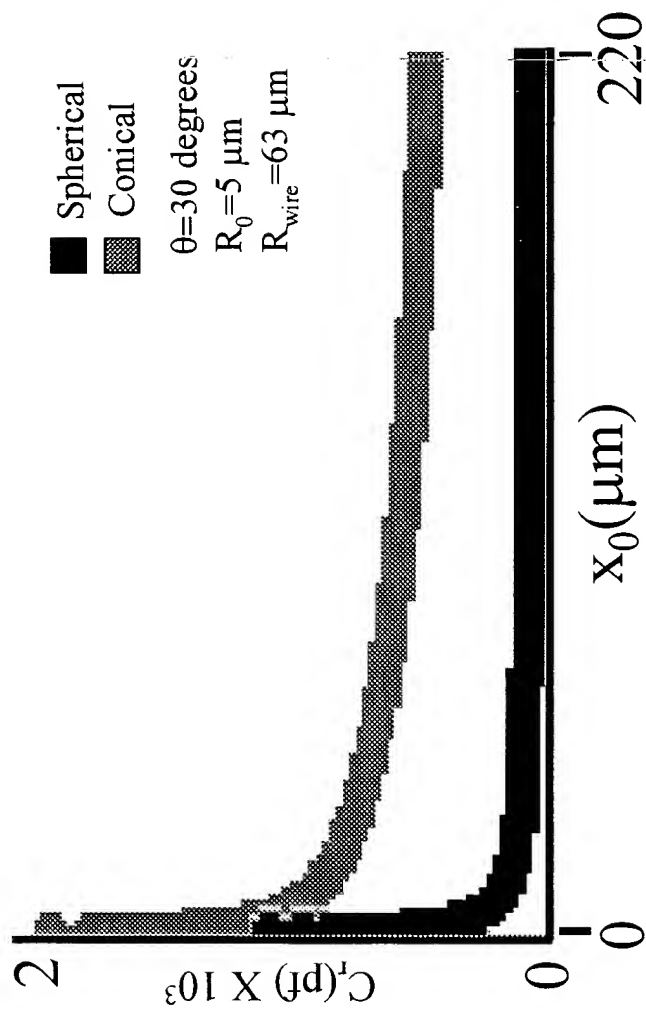


Fig. 10

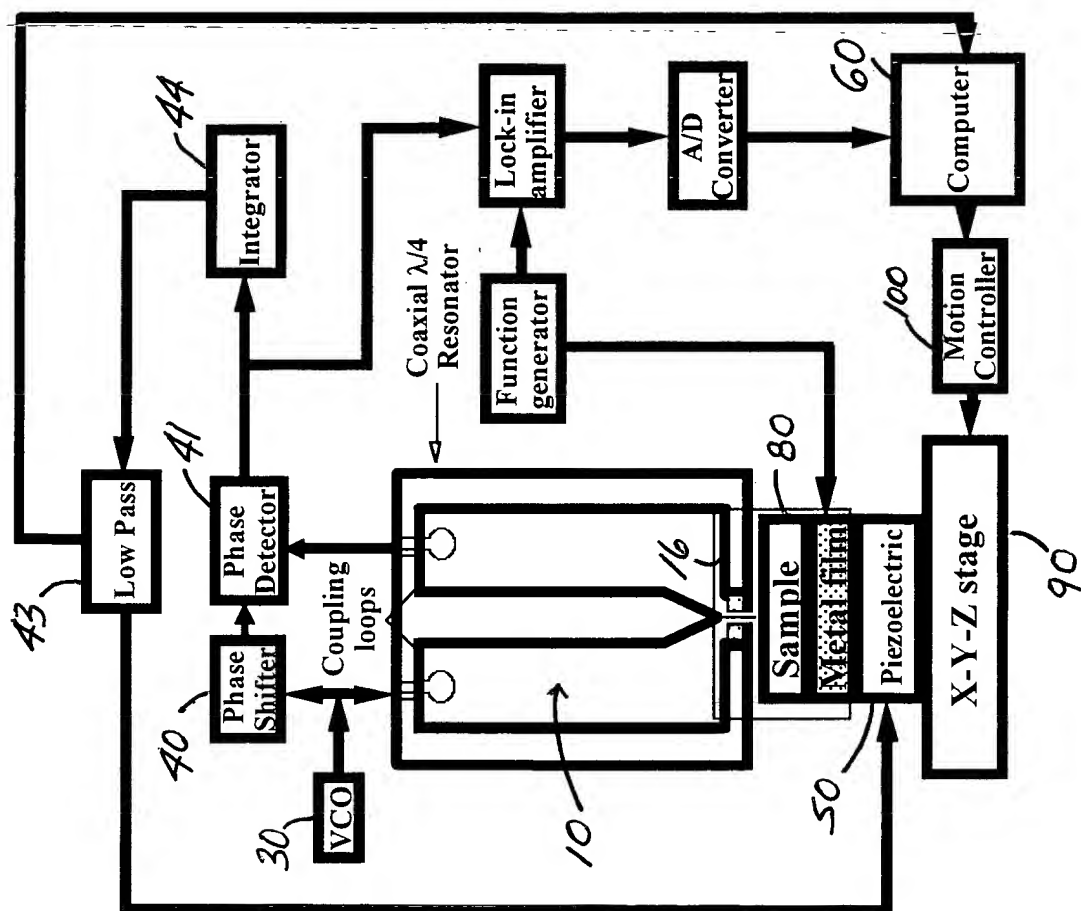


Figure 11

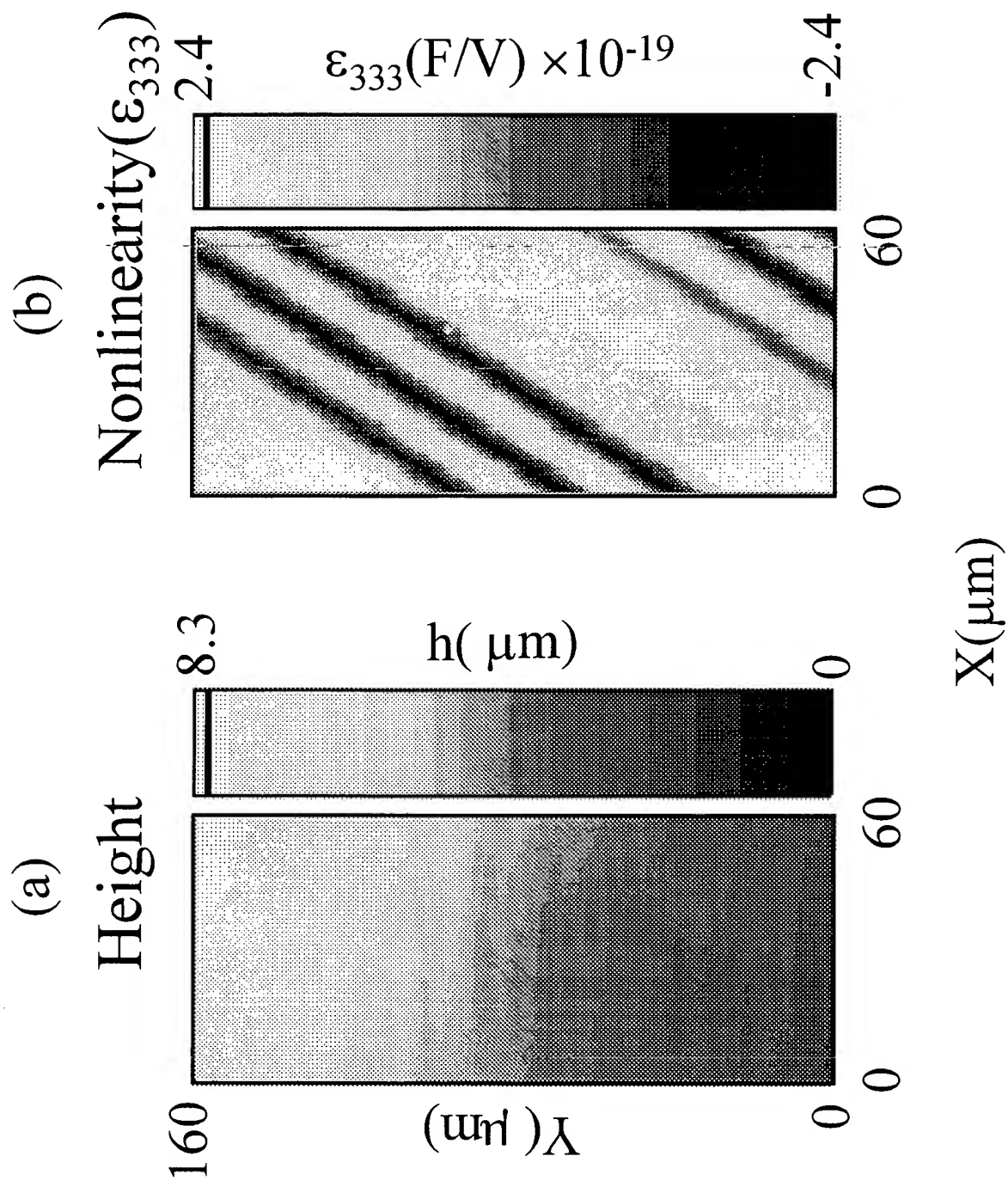


Figure 12

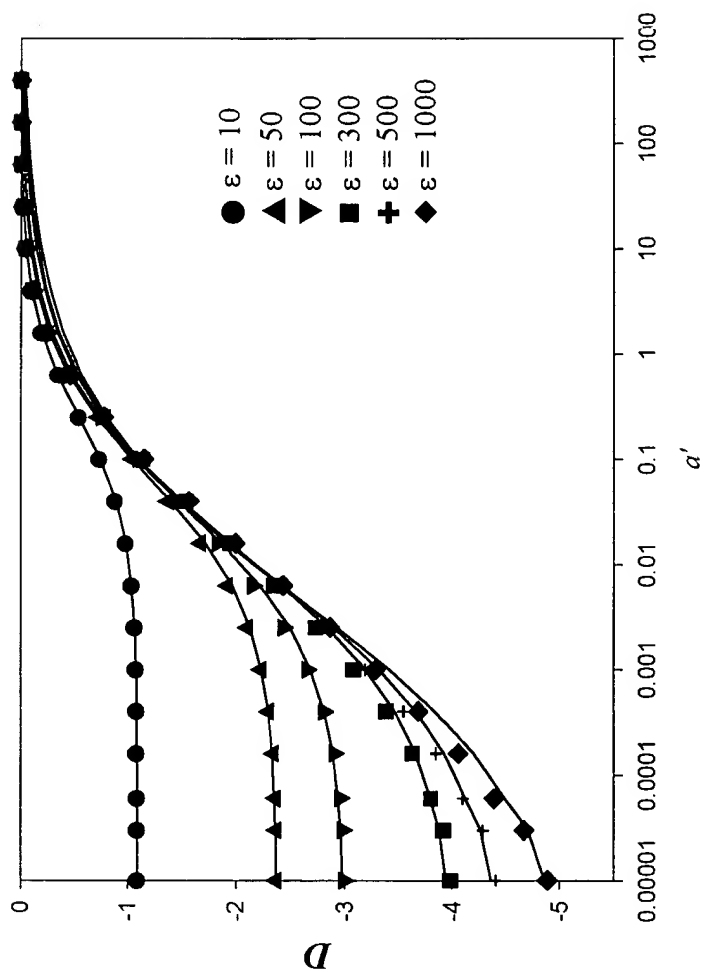


Fig. 13



Derivative signal (pf/ $\mu\text{m}$ ) vs Tip-sample separation ( $\mu\text{m}$ )

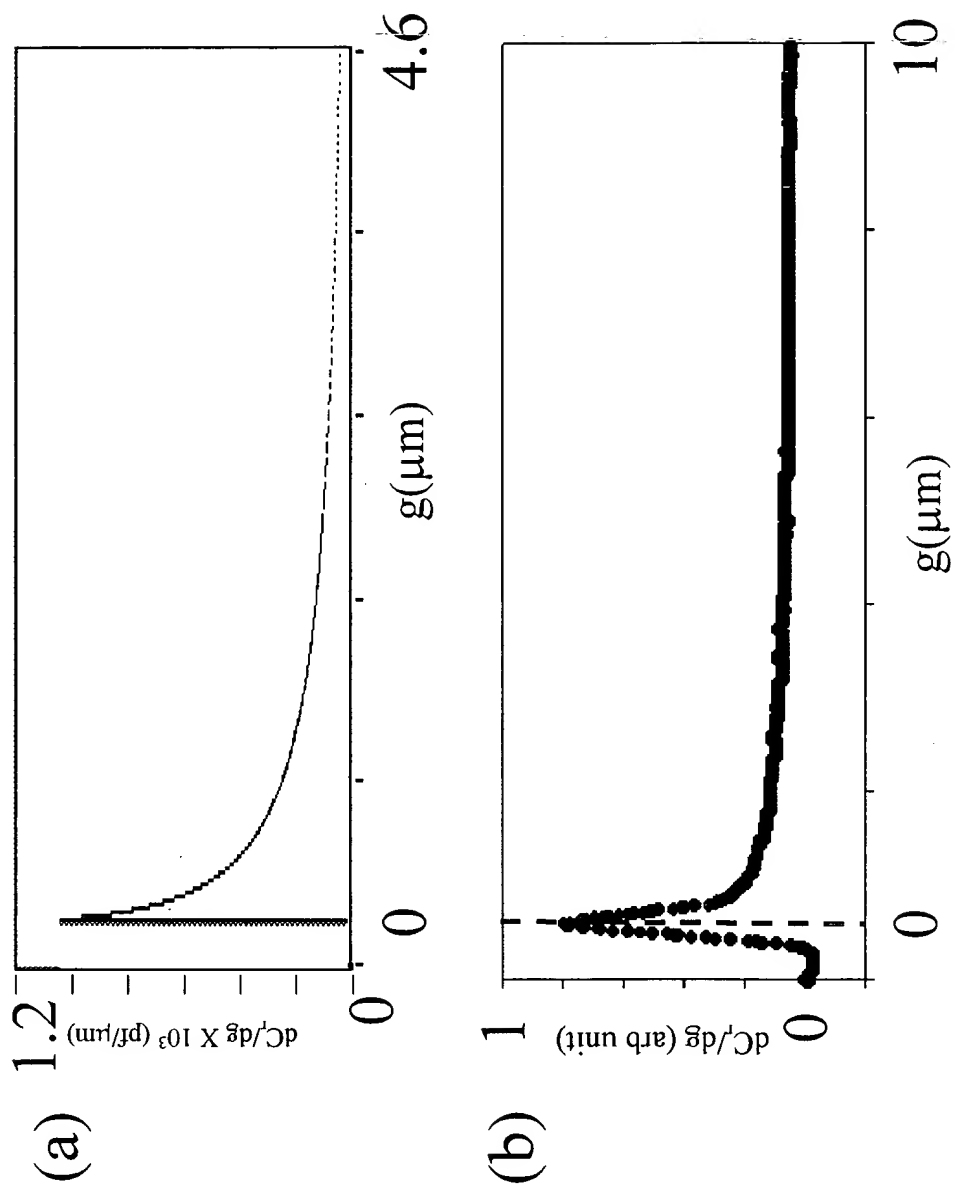


Fig. 14

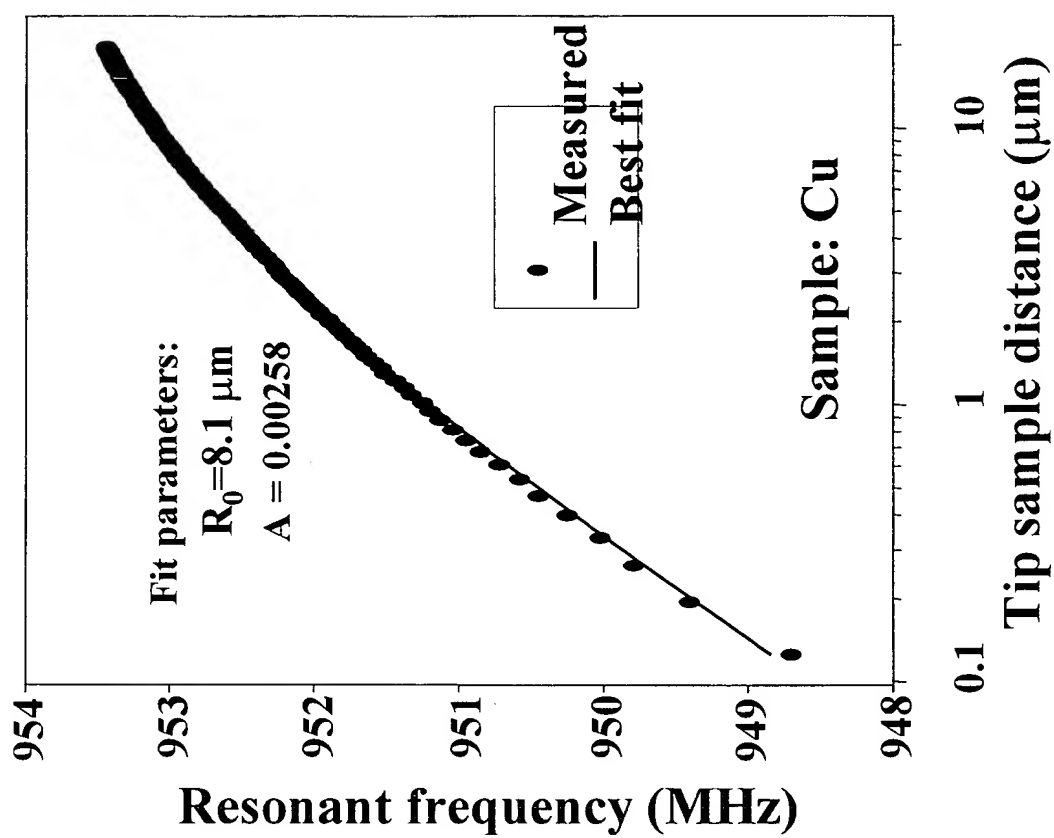


Fig. 15

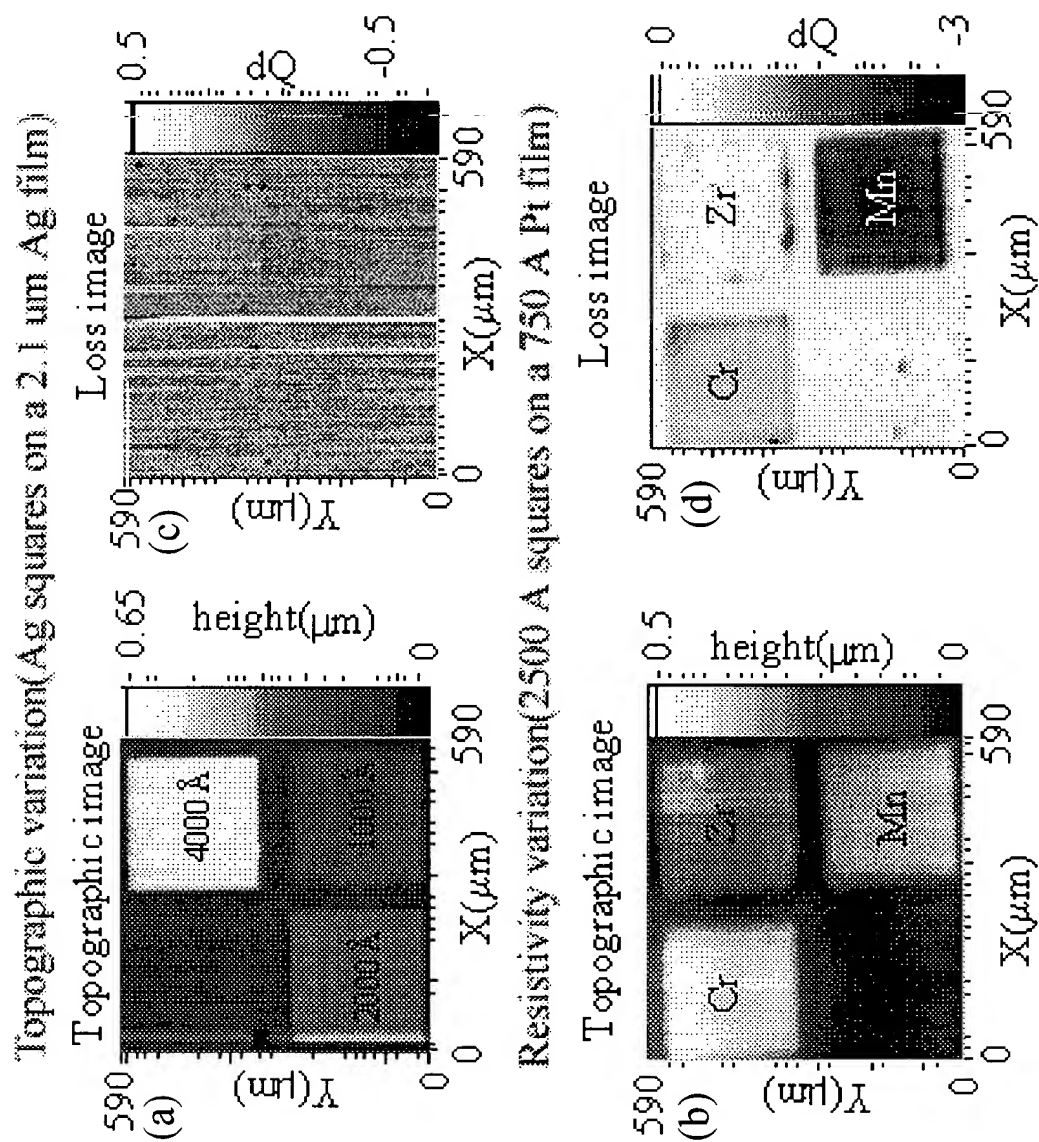


Fig. 16



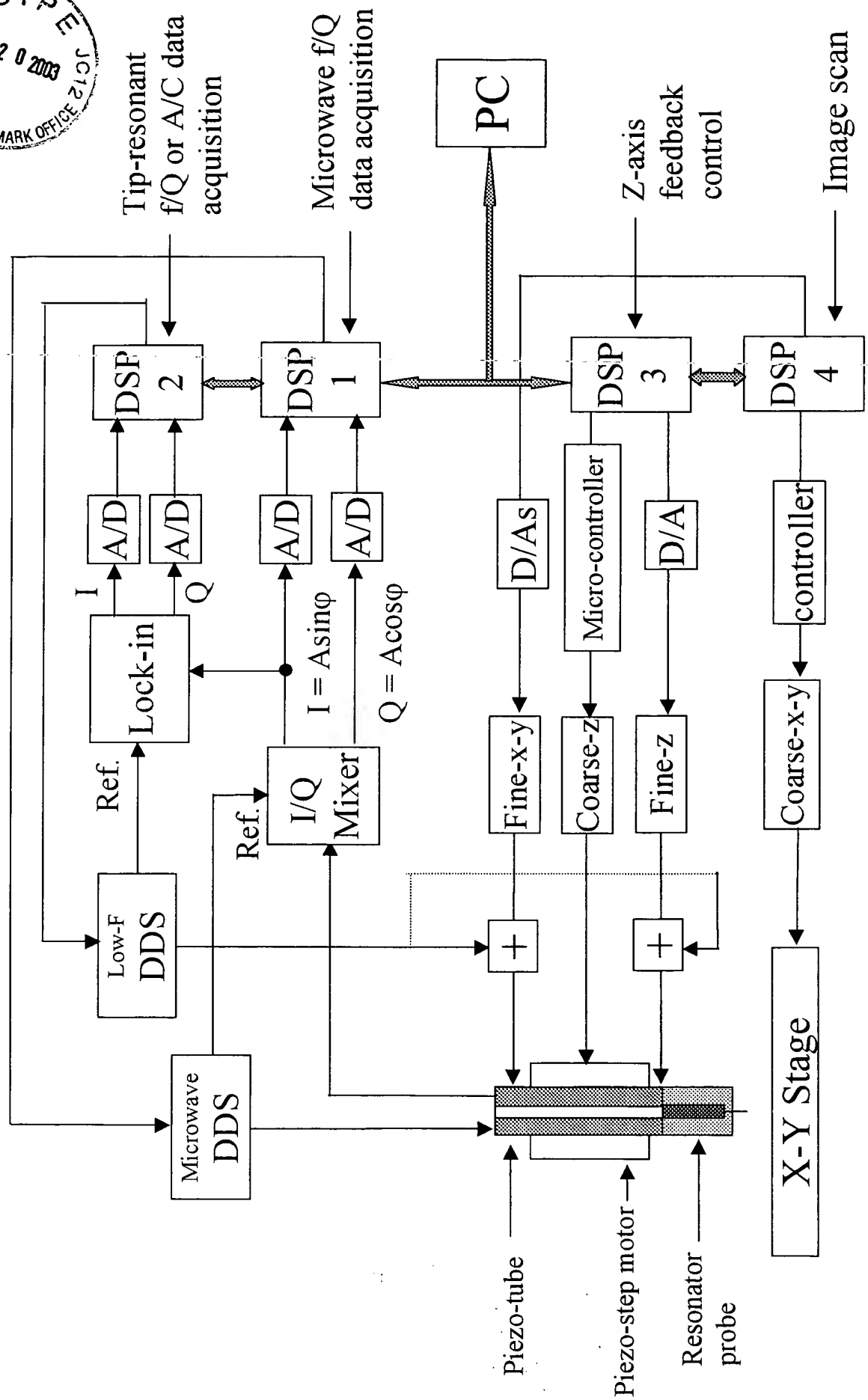


Fig. 17

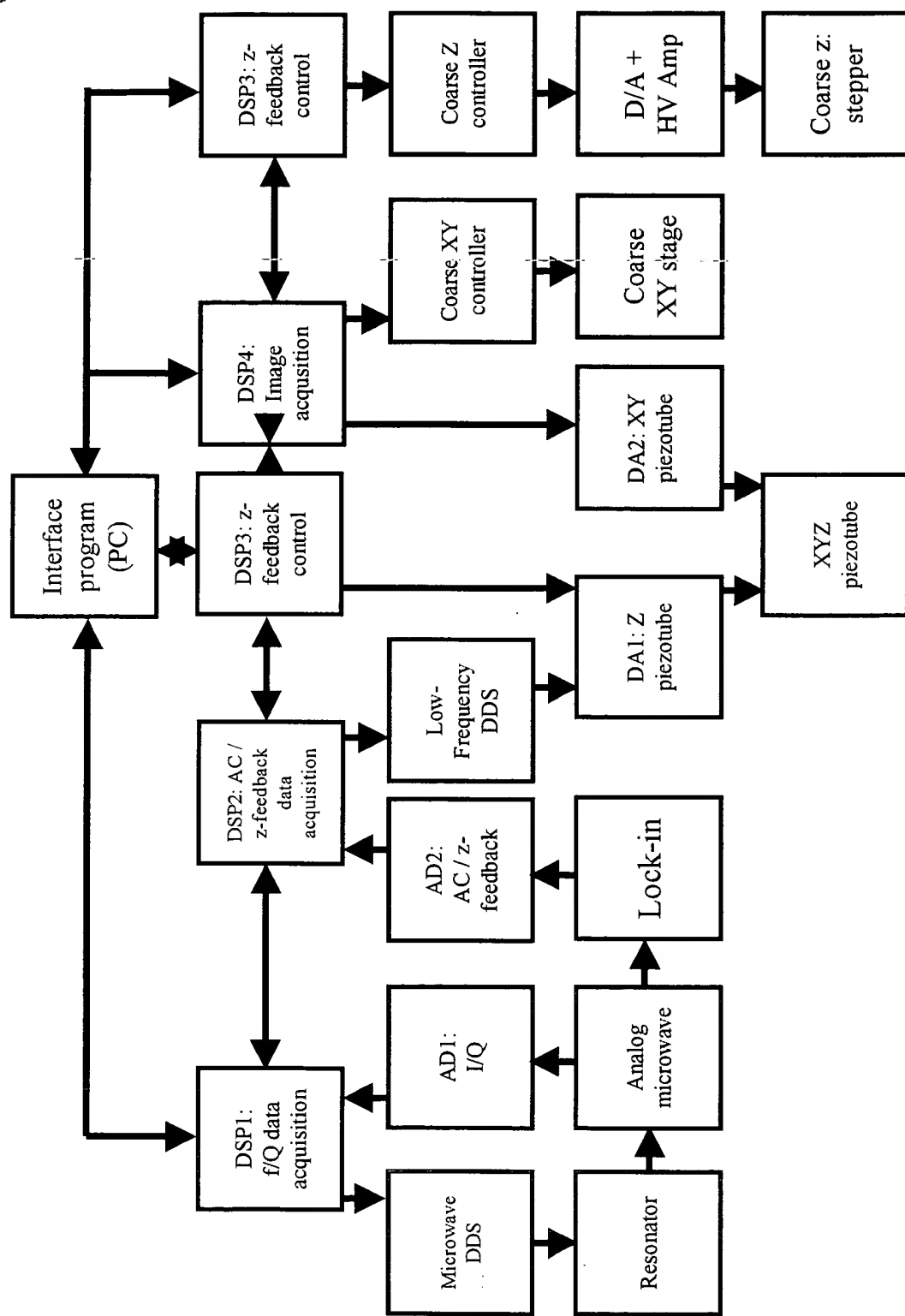
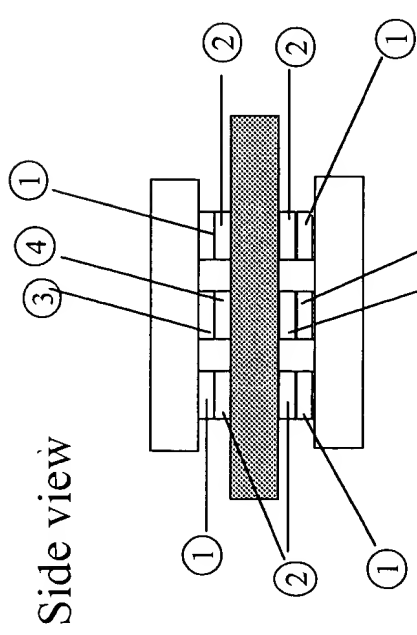
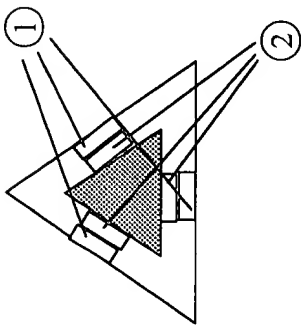


Fig. 18



Cross section view



② Expansion plate  
① Shear plate

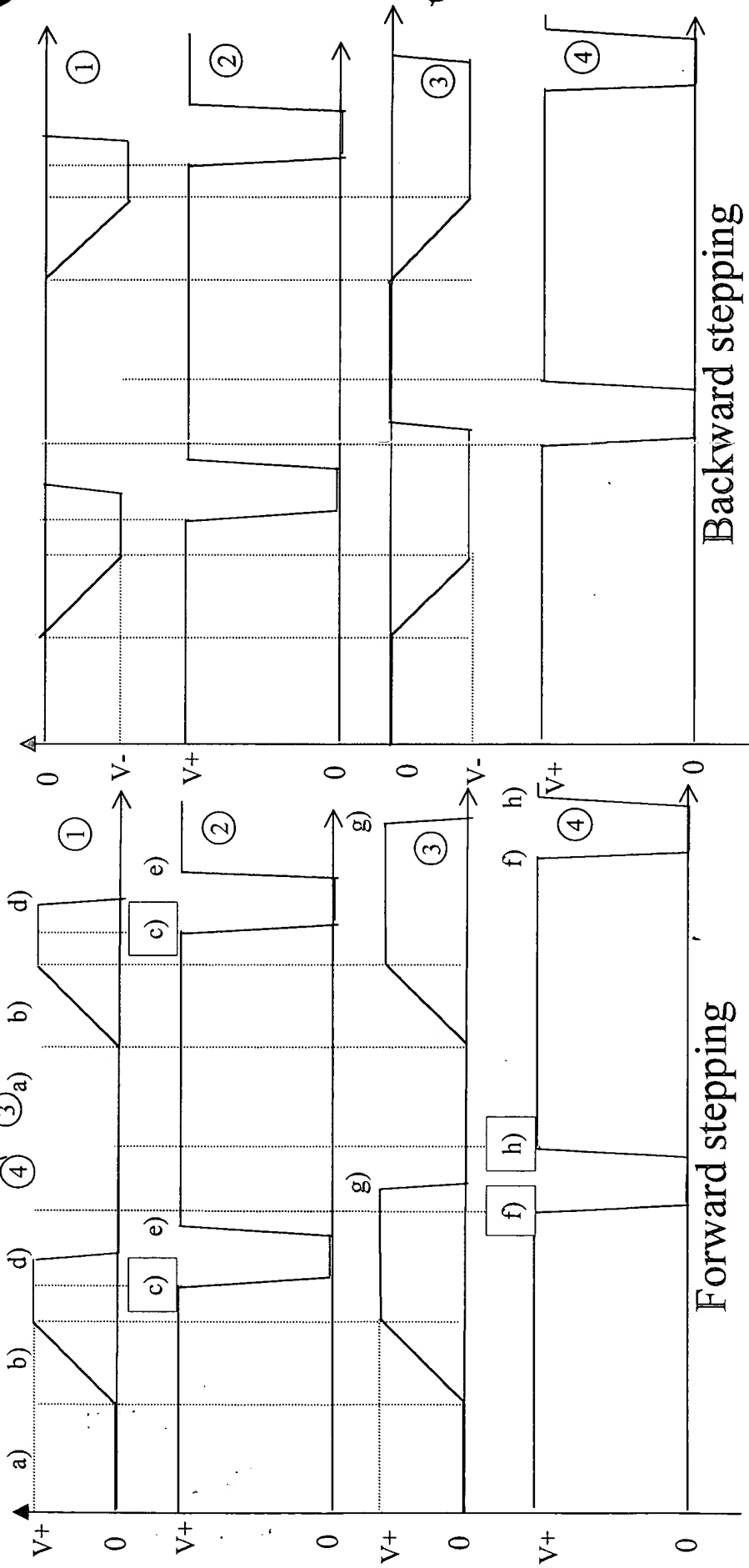


Figure 19.

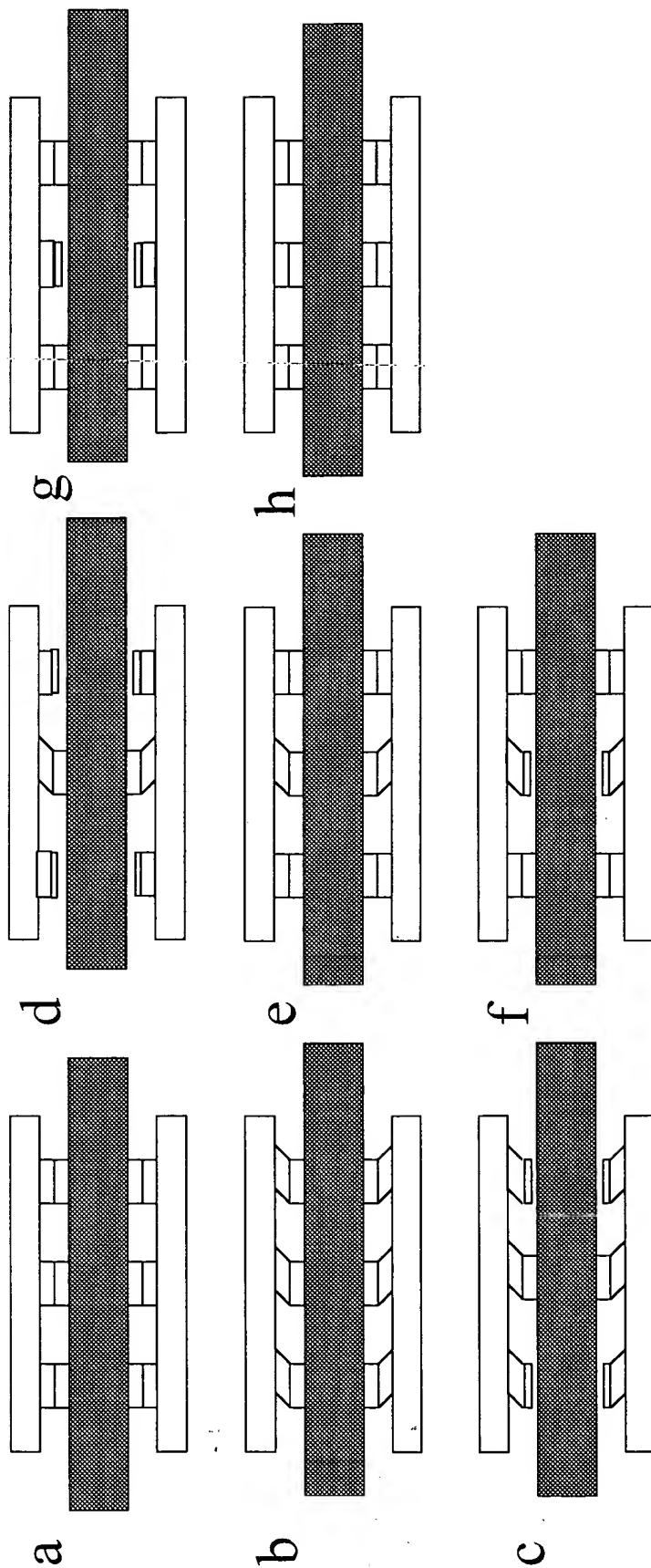


Figure 20



## Integration of AFM

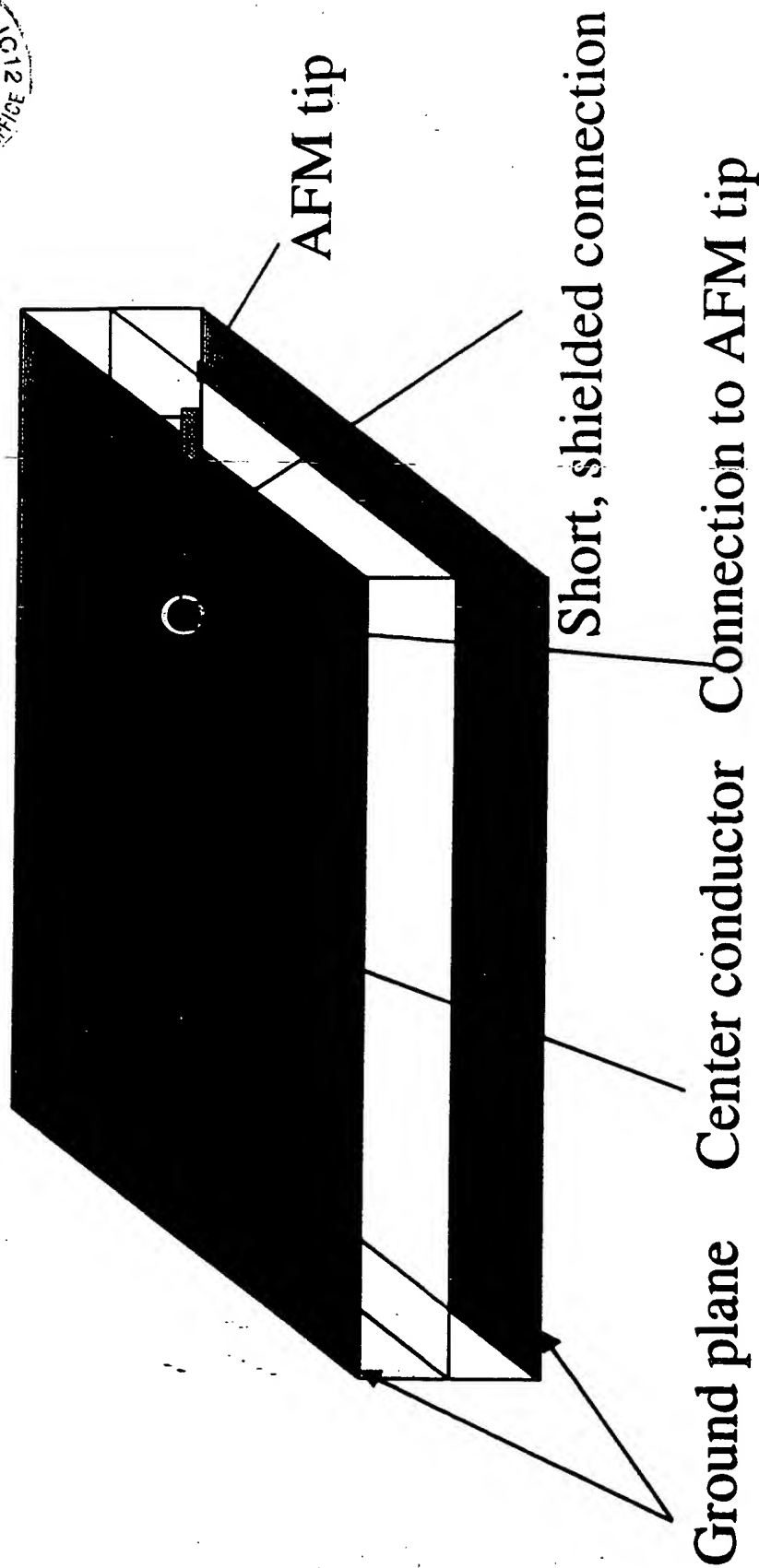


Figure 21.